

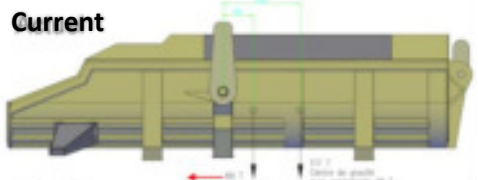


Increase the steel recycling



The project aims to increase the part of used steel (scrap) in the production process of the Fos-sur-Mer steel mill. This involves adapting the scrap processing capabilities as well as installing an electric furnace (ladle furnace) downstream of the converter to compensate for the cooling of the liquid steel associated with this addition.

Starting date of the project	2020	
Project Localisation Places of implementation of the project at this stage and targeted geography if replicable.	ArcelorMittal Méditerranée steel mill in Fos-sur-Mer, Bouches du Rhône (France). The group's steel mills in Europe are all working on increasing pre- and post-consumption steel in their production. As the Fos-sur-Mer (cast) blast furnace sector is technically and economically highly efficient, the use of recycling steel has not been significant so far and the necessary technical means must now be put in place.	
Project objectives Type of climate innovation of the project with a description of the problem/issue addressed	The aim is to increase the part of recycled steel (scrap) in the steel production process in order to: <ul style="list-style-type: none"> • Reduce blast furnace melt production and associated CO₂ emissions; • Promote the recycling of used steel - pre and post-consumption steel now exported in large quantities. 	
Detailed project description	<p>The steel produced in the Fos-sur-Mer plant is produced in blast furnaces from iron ore and coal (in the form of coke and injection). The cast is then processed in a converter. In order to limit the consumption of iron ore and coke, whose use results significant CO₂ emissions, it is possible to incorporate used steel - or scrap - into the production process. The larger the scrap, the smaller the quantities of raw materials needed.</p> <p>Currently, the Fos-sur-Mer site produces nearly 4 million tonnes of steel. Nearly 500,000 tonnes of scrap are now uses, including 400,000 tonnes from internal recycling at the plant and 100,000 tonnes purchased outside. The aim is to increase the part of scrap purchased outside to 400,000 tonnes per year (or 8,000 tonnes of scrap metal in total to produce the 4 Mt of steel). To achieve this, several steps are needed:</p> <ol style="list-style-type: none"> 1. Steel Recycling - Scrap Management The increase in the share of scrap in the production process requires a total resizing of the means of receiving, processing, processing and injecting the scrap into our converters. These new needs will be supplied by so-called "noble" scrap but also by low-quality scrap containing a greater proportion of residual elements (aluminum, copper, non-ferrous: wood, plastics, etc.). It is therefore necessary to review the site's capacity to prepare / clean the scrap before charging. This involves, in particular, the resizing of the means for feeding the scrap into the converters (the "augets") and the setting up of means aimed at densifying the scrap (sorting, compacting, etc.). 2. Steel Recycling - Installing an electric oven (ladle furnace) The transformation of cast iron into liquid steel is carried out in an oxygen converter. The first step is to charge liquid cast iron and the steel coming from recycling (cold). The converter will decarburize (oxygen blast) the cast iron and increase the temperature of the mixture and thus melt the scrap. The temperature target depends on the production cycle up to continuous casting. Integrating an electric heating means, such as the "ladle furnace", between converter and continuous casting increases the proportion of scrap iron loaded by targeting lower temperatures at the end of blowing. 	
Main project's drivers for reducing the greenhouse gas emissions	Reduction levers	Details on the aspects of the project
	<input type="checkbox"/> Energy and resource efficiency (including behaviour)	
	<input type="checkbox"/> Energy Decarbonisation	
	<input type="checkbox"/> Energy efficiency improvements	
	<input checked="" type="checkbox"/> Improving efficiency in non-energy resources	Decrease of primary energy consumption (coal used in material use) and electrification of the process
	<input checked="" type="checkbox"/> Emissions absorption: creation of carbon sinks, negative emissions (BECCS, CCU/S, ...)	Decrease of limestone (castine) and lime consumption (preparation of agglomerated ore) Use of recycled steel in the production process.
	<input type="checkbox"/> Financing low-carbon producers or disinvestment from carbon assets	

	<input type="checkbox"/> Reduction of other greenhouse gases emission		
Emission scope(s) on which the project has a significant impact and quantification of GHG emission reductions per emission scope		Aspects of the project contributing to the reduction of emissions by emission category	Quantification of associated GHG emissions by emission category Please follow the quantification methodology used in the Afep guidelines .
	Reduction of the company's carbon dependency		
	Scope 1 <i>Direct emissions generated by the company's activity.</i>	Use of recycled steel in the manufacturing process	- 680 ktCO2/an
	Scope 2 <i>Indirect emissions associated with the company's electricity and heat consumption.</i>	Consumption of local scrap metal as a substitute for imported coals and ores	- 25 ktCO2/an
	Scope 3 <i>Emissions induced (upstream or downstream) by the company's activities, products and/or services in its value chain.</i>		
	Increase of carbon sinks		
	Emissions Absorption <i>Carbon sinks creation, (BECCS, CCU/S, ...)</i>		
	GHG emissions avoided by the company at third parties		
	Avoided Emissions <i>Emissions avoided by the activities, products and/or services in charge of the project, or by the financing of emission reduction projects.</i>		
	Clarification on the calculation or other remarks Each tonne of recycled steel reduces the use of melt from blast furnaces by about 0.9t (production generates about 1.9 t of CO ₂ eq per tonne of cast iron). The additional electricity consumption (43,000 MWh/year) results in emissions of around 2,461t of CO ₂ eq/year taking into account the average FE of electricity in France (57.1 kg CO ₂ /MWh). The site's CO ₂ emissions are # 7,659 kt CO ₂ in 2019. Gains if the investment is decided in early 2021 <ul style="list-style-type: none"> 680 kt CO₂/year in 2023, so about 10% of the site's emissions 		
Modality of verification of the quantification.	Calculation standard used (ADEME base, GHG protocol, etc.): The Fos-sur-Mer site is subject to ETS declaration. ADEME Project "Fos Circular Steels" Verification of the calculation (internal or external): LRQA annual Audit		
Other environmental and social benefits of the project	This project allows to: <ul style="list-style-type: none"> Develop local steel recycling channels Decrease scrap exports Reduce imports of coal and minerals Reduce water and air emissions associated to the cast iron industry (coke plant, agglomeration, blast furnaces) 		
Project maturity level	<input checked="" type="checkbox"/> Prototype laboratory test (TRL 7) <input type="checkbox"/> Real life testing (TRL 7-8) <input type="checkbox"/> Pre-commercial prototype (TRL 9) <input type="checkbox"/> Small-scale implementation <input type="checkbox"/> Medium to large scale implementation Remarks: The process is mature and already industrialized at other ArcelorMittal sites.		
Capacity and conditions of the project reproducibility, with associated climate impact mitigation potential	The potential is specific for every steelwork. A second step is being considered to further increase the share of recycled steel through a second partial electrification of the process.		
Amount of investment made (in €)	3 M€ - Augets furnace to the converter 60 M€ - Twin ladle furnace and its power supply Investments carried by third parties: About 10 M€ - Management of the scrap yard, preparation (carried by a subcontractor) About 12 M€ - Ships dismantling in Fos-sur-Mer		

Economic profitability of the project (ROI)	<input checked="" type="checkbox"/> ST (0-3 years) <input type="checkbox"/> MT (4-10 years) <input type="checkbox"/> LT (> 10 years) Remarks: Click or tap here to enter text.
Engaged partnerships	Partnerships are being developed and are mainly aimed at securing the supply of scrap metal to the site. For example, a ship dismantling line is being developed with Topp Decide in the Grand Port Maritime de Marseille, to produce good quality scrap metal.
Open comments from the project owner	/
More about the project	
Contact the company carrying the project	damien.chambolle@arcelormittal.com (Site Decarbonization Program) and bruno.lesaulnier@arcelormittal.com (Steel Recycling Projects)
Project URL links	https://www.maritima.info/actualites/economie/fos-sur-mer/11607/arcelormittal-fos-le-processus-zero-emission-de-dioxyde-de-carbone-est-lance.html
Illustrations of the project	New furnace augets
	<p>Current</p>  <p>Future</p> 
	<p>Ladle furnace</p> 
	<p>Ships dismantling</p> 